

## Electrical Resistance

When electrons travel through the wires of an electric circuit, they collide with one another, releasing some of their energy. If the wires are good conductors (copper), little energy is lost.

Other materials, such as tungsten wire in light bulbs, cause the electrons to lose much more energy, converting electrical energy into heat (**thermal**) energy. In a light bulb, this thermal energy heats the wire so much it glows.

All materials slow down (**impede**) electrons to some extent. **Electrical resistance** is the ability of a substance to impede the flow of electrons in a conductor.

**Resistors** are devices used in circuits to purposely impede electrons.

Resistance causes a drop in electric potential (voltage) between entering and exiting the conductor. This difference in voltage is called **potential difference** or **voltage drop**. The symbol for resistance is **R**, and the SI unit is the **ohm** ( $\Omega$ ).

**Ohm's law** states that the potential difference between two points on a conductor depends on the resistance of the conductor or load. The mathematical equation is:

$$\begin{aligned}\text{potential difference (V)} &= \text{electric current (I)} \times \text{resistance (R)} \\ V &= I \times R\end{aligned}$$

Ohm's law only applies to types of electrical loads called **ohmic resistors**, which do not change resistance with temperature.